Remarks

Entry of the amendments, reconsideration of the application, as amended, and allowance of all pending claims are respectfully requested. After entry of the amendments, claims 1-25 are pending.

In the above amendments, the original independent claims have been amended to clarify that in one embodiment the resource is a replicated resource of a distributed computing environment and that the conflict is satisfied without requiring locking of the resource. Support for these amendments can be found throughout the specification. For example, support for a replicated resource can be found, for instance, on pages 10-11 of the Specification, and support for locking can be found, for instance, on pages 26-33 of the Specification, in which a two-phase commit protocol is used to satisfy the conflict instead of locking. Therefore, no new matter is added.

Additionally, dependent claim 25 has been added to explicitly recite that the conflict is satisfied using a two-phase commit protocol. Support for this amendment can be found on pages 26-33 of applicants' Specification. Therefore, no new matter is added.

Applicants gratefully acknowledge the indication of allowability of claims 8, 9, 15, 16, 22 and 23, if rewritten in independent form. Applicants have rewritten claims 8, 15 and 22 in independent form, and thus, respectfully request an indication of allowability for those claims. Claims 9, 16 and 23 depend therefrom, and therefore, applicants respectfully request an indication of allowability for those claims, as well.

In the Office Action dated May 6, 2003, claims 1-7, 10-14, 17-21 and 24 are rejected as being unpatentable over Schmuck et al. (U.S. Patent No. 5,946,686) in view of Carroll et al. (U.S. Patent No. 5,812,853). Applicants respectfully, but most strenuously, traverse this rejection for the reasons below.

In one aspect, applicants' invention is directed to a serialization technique that resolves conflicts associated with replicated resources without using locking. Instead, a two-phase commit protocol is used. For example, data is transmitted in a first phase, called a prepare to commit phase, and a transaction is committed in a second phase, called a commit phase. The first phase of the two phase commit process is allowed to proceed in parallel to allow the

replication of transactions to be more efficient. Then, the commit phase is serialized based on the token information sent in the prepare to commit phase in order to preserve data consistency. It is this two-phase commit protocol that is used to resolve conflicts, instead of locking.

In one example, applicants recite a method of serializing replicated transactions in a distributed computing environment (e.g., claim 1). The method includes, for instance, initiating a modification operation on a replicated resource of a distributed computing environment; during a phase of the modification operation, detecting whether a conflict for the replicated resource exists; and satisfying the conflict, if the conflict exists, without requiring locking of the replicated resource. Thus, in this example of applicants' claimed invention, the resource is a replicated resource, and a conflict for the replicated resource is satisfied without requiring locking of the replicated resource. Instead, as described herein and explicitly claimed in newly added dependent claim 25, the locking is replaced by a two-phase commit protocol. This is very different from the teachings of Schmuck and Carroll, either alone or in combination.

For example, Schmuck does not teach or suggest a replicated resource, but instead teaches a shared disk file system. In a shared disk file system, the data is stored on shared media that is accessible by a plurality of nodes (e.g., Abstract; Col. 16, lines 8-10, etc.). The data is not replicated and there is no need for replication in a shared system. Replication is typically provided in environments that are referred to as shared nothing environments, as opposed to shared environments. There is no teaching or suggestion of replicated resources in Schmuck. Therefore, Schmuck does not teach or suggest applicants' claimed invention.

Further, Schmuck does not teach or suggest, as admitted in the Office Action, that a conflict is satisfied without requiring explicit locking of the resource. Thus, Schmuck does not teach or suggest this aspect of applicants' claimed invention, either.

Since Schmuck fails to teach or suggest one or more aspects of applicants' claimed invention, Schmuck is combined with Carroll. However, *assuming arguendo*, that the combination is proper (which is not being conceded by applicants), the combination still fails to teach or suggest one or more aspects of applicants' claimed invention. For example, Carroll also fails to teach or suggest initiating a modification operation on a replicated resource of a distributed computing environment. Carroll teaches a technique for processing source code in a language processing system with improved parsing based on prefixed analysis. There is no

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discussion in Carroll of replicated resources. Further, there is no teaching or suggestion in Carroll of how to serialize replicated transactions in a distributed computing environment, as claimed by applicants. For this reason alone, Carroll does not teach or suggest applicants' claimed invention. Further, since both Schmuck and Carroll fail to teach or suggest applicants' claimed element of initiating a modification operation on a replicated resource, the combination of those references also fails to teach or suggest this feature of applicants' claimed invention. Thus, applicants' claimed invention is patentable over the combination.

In a further example, applicants respectfully submit that Carroll also does not teach or suggest satisfying the conflict without requiring locking of the resource. It is explicitly stated in Carroll that to prevent conflicts, the well known technique of explicitly locking and unlocking the file containing the stored prefix tree may be used. It then goes on to say that alternatively the prefix tree could be stored in a database, thereby providing serialization of access without having to deal with explicit locking (Col. 11, lines 60-65). However, applicants respectfully submit that it is well known in the art that although the database eliminates explicit file locking, it does not eliminate locking of the resource, and therefore, even though a database is used, locking is still being performed, unlike that claimed by applicants. The use of locking in database systems is described, for instance, in an article entitled "A Theory of Correct Locking Protocols for Database Systems," by Donald S. Fussell, Zvi M. Kedem, Abraham Silberschatz, found in a book entitled, Very Large Data Bases, 7th International Conference, IEEE Computer Society, 1981, pages 112-124. An abstract is included herewith and can also be found at http://www.vldb.org/dblp/db/conf/vldb/FussellKS81.html.

With applicants' invention, there is no locking of the resource, but instead, a two-phase commit protocol is utilized. This two-phase commit protocol removes the need for locking and provides various benefits over locking. These benefits include, for example, improved performance because instead of performing locking on every resource, the two-phase commit is only used, in this embodiment, when there is a conflict. There is no teaching or suggestion in Carroll of eliminating locking, as claimed by applicants. Thus, Carroll does not teach or suggest applicants' claimed feature of satisfying a conflict for a replicated resource without requiring locking. Further, since both Schmuck and Carroll fail to teach or suggest this aspect of applicants' claimed invention, applicants respectfully submit that their invention is patentable

over the combination of Schmuck and Carroll, and respectfully request an indication of allowability for claim 1, as well as claims 2 and 3.

The dependent claims are patentable for the same reasons as the independent claims, as well as for their own additional features. For example, dependent claim 25 explicitly recites that to satisfy the conflict, a two-phase commit protocol is used. There is no discussion at all in Schmuck or Carroll of a two-phase commit protocol. At most, Carroll mentions committing transactions, but there is no discussion of a two-phase commit protocol. Further, there is no discussion of using a two-phase commit protocol to satisfy conflicts, when conflicts are detected. Thus, applicants respectfully submit that this feature is not taught or suggested by the combination of Schmuck and Carroll.

As a matter of fact, Carroll teaches away from using any commit protocol, since Carroll explicitly states that there are problems with commit protocols (Col. 12, lines 13-20). For example, Carroll indicates that it might be difficult to implement a procedure in which there is a commit and restart of a transaction after examining every k nodes; the resulting processing steps might be noticeably slower; and the resulting processing steps may serialize incorrectly. Thus, Carroll indicates that a commit protocol may be difficult and cause serialization problems. To avoid this, applicants use a two-phase commit protocol, which is not at all mentioned, taught or suggested in Carroll. For these reasons, applicants respectfully submit that Carroll does not teach or suggest applicants' claimed invention. Since both Schmuck and Carroll fail to teach or suggest applicants' claimed element of satisfying a conflict of a replicated resource without requiring locking and by using a two-phase commit protocol, applicants respectfully submit that the combination of Schmuck and Carroll fails to teach or suggest applicants' claimed invention. Thus, applicants respectfully request an indication of allowability for dependent claim 25.

Based on the foregoing, applicants respectfully request an indication of allowability for all pending claims.

Should the Examiner wish to discuss this case with applicants' attorney, please contact applicants' attorney at the below listed number.

Respectfully submitted,

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